NATURAL DYES AND PROCESSES

Blue, red and yellow, dyed with woad, indigo, madder and weld. These dyes are all part of our textile heritage. Jeanette Schäring takes us on a sensory journey into the world of pigment obtained from nature.

JEANETTE SCHÄRING

MA Textile Art, HDK School of Design and Crafts, 2006.
Jeanette's field of work is in Sweden and beyond. She is interested in expanding the understanding and perceptions involved in natural dyeing to embrace a wider sustainable perspective. Her work is also about renewing the value of natural dyeing and its place in contemporary art.
Currently: In 2014 Jeanette began a 7.5 credit tertiary level course at Steneby, Gothenburg University.

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NATURAL DYEING is now part of a global movement involving artists and designers who want to work with natural, living and environmentally friendly dyes as artisans and in the textile industry.

Dyeing is a slow process, a time-consuming, complex and undervalued craft. Plant dyes can provide an environmentally friendly alternative to synthetic dyes, especially when derived from leftover food and plants, which are renewable, non-toxic and biodegradable. Yet water shortage is a huge challenge now and will be in the future. How do we develop sustainable dye processes?

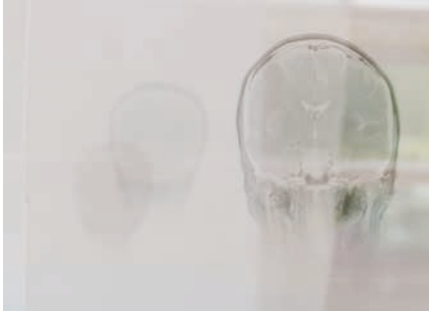
I use colour from nature as a social, cultural and perceptible form of communication between nature, animal and human beings, as well as an indicator of our fragile eco-system. I don't use ready-made recipes. Colour and patterns are mutable, resonances of nature's complexity, sensitive to nature's rhythms, waves and movements. These are place-specific dye processes. A humble and loving approach to the transience of organic material and processes embeds the struggle against time and the innate human resistance to changeability.

Botanical colour varies, depending on the growing conditions and other dynamic processes. In addition, the properties of the water are amongst the most important factors in dyeing.

When plant dyed fibre is exposed to sunlight, many multi-faceted shades are created. How do we look at colour as something living? Dyed garments that in the passage of time, depending on our surroundings, environment and bodies, change in colour?

Natural dyeing is like cooking. Food and colour belong together, as do food culture and colour culture. Natural dyeing links all these cultures together. An important source of inspiration for me was Hannele Köngäs of Åbo, Finland. She gave me confidence in my perceptions about the properties and potential of pigment in nature.

In 2012, I embarked on a visionary art interdisciplinary project between textile art, science and learning processes in collaboration with Professor Jonas Bergquist (analytical chemistry and neurochemistry) at Uppsala University. The start-point for this project was water and pigment in nature – our environment and sensitive eco-system, though it was also to embrace the chemistry of the human brain and interpretations of natural phenomena.



Woad

WOAD IS A BIENNIAL PLANT that grows in small rosette clusters in its first year. The green leaves contain the blue dyestuff. In the second year, the plant grows upwards and produces a bunch of light yellow flowers that in turn bear copious amounts of dark violet seed.

The first year leaves contain the most pigment, but pigment can be extracted from second year leaves, though in smaller quantities and with variable quality. Seed can be planted in a pot in the autumn, as woad is frost hardy, so leaves can be harvested already in late spring and several times more through the growing season. Sometimes woad may grow upwards and flower in the first year, depending on the climate.

WOAD LEAVES CONTAIN *indikan*, the same substance as is found in the *Indigofera tinctoria* plant, but much less concentrated. This is what gives woad its special and unique character as a dyeplant. Woad also has much to offer as an alternative to the synthetic dye pigments used today which contains toxins and are a drain on resources. No mordants are required for dyeing with woad and indigo.

THE PROCESS OF EXTRACTING the dyestuff and dyeing with woad is more complicated than with many other dyestuffs obtained directly from the natural world. A wide spectrum of beautiful blues can be produced, from sky blue to a deep saturated blue. Weather conditions, wind, water and where the plant grew – the soil – are all significant, and the fermentation process, moon and type of fibre being dyed play their part. All of these factors combined mean it is almost impossible to predict which blue tone will be obtained. I am fascinated by these dynamic processes with their variable dye results, which are comparable to wine vintage. For me, woad dyeing is a subtle, sensitive art form.

Using woad for dye purposes requires complex chemical reactions, primarily reducing (removing oxygen) and oxidizing (re-introduction of oxygen). The dyestuff, indikan, has to be chemically reduced into a water soluble form, which can be achieved through a biological fermentation process, shown overleaf.

WOAD DYEING with these time-consuming bio-fermentation processes is a valued skill. During the 18th century in Borås, dyers who used these processes had high status, specially those who dyed vadmal with woad. The latter were known as 'skönfärgare' (fine dyers).

BIOLOGICAL VAT

Over the course of time, many different fermentation processes have been used to extract blue from woad. In Sweden, much mention has been made of the urine ferment and how the woad vat would be buried in a dung pit, which kept it at the perfect temperature. Urine ferment works well and there are many theories as to which urine is best. Urine provides a steady fermentation and reducing process. Unfortunately, these processes are pretty smelly. I have focused on processes that can be used in a flat in the middle of town.

Jeanette Schäring on the big balcony of her 7th floor flat in east Gothenburg, where she has created a mini eco-system, growing herbs, food- and dyestuffs. She also has a greenhouse, and different types of plant and food composts.
left / Digital print of artist Jeanette Schäring's brain on silk dyed with woad. Photo Jeanette Schäring.

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Dyeing with woad

EXTRACTING THE BLUE PIGMENT. Pick or cut first year leaves. If necessary, rinse them off in some warm water. Tear up the leaves. Be prepared for surprise and wonder! If you want a more sensory experience of woad, carry on tearing, mashing and squeezing out the green juice and shape into small woad balls. Save these woad balls for use later or simply as beautiful objects.

Heat up the water, preferably soft water, in a big kettle and pour into a stainless steel bowl. Press the torn up leaf mass down into the water with a wooden spoon. You can also place the torn leaves in a glass bowl and pour almost boiling water over, then place a lid on top. I use fairly small amounts of water relative to the plant matter, more by feel. Let this draw for 50 minutes up to little more than one hour. Squeeze and press out all the liquid to obtain all the pigment. The water will now be brownish.

Remove the plant parts and save them, these can be used to colour with or added to the compost.

Add a little alkali/base, such as bicarbonate, washing soda, slaked lime or fine birch ash (if using birch ash, dilute well with water). The liquid will now change colour!

WOAD (ISATIS TINCTORIA)

has been used for millennia for dyeing wool and other natural fibres. It is closely related to broccoli, cabbage and cauliflower. Archaeological finds indicate that woad was cultivated in Europe from the Neolithic period, ca 8,000-3,000 BC. Our sagas describe Odin as dressed in blue. At present woad grows wild on Åland, Gotland, Öland and down the east coast of Sweden.

"If you want a more sensory experience of woad, carry on tearing, mashing and squeezing out the green juice and shape into small woad balls."

NOW POUR THE LIQUID from one bowl to another to oxygenate the liquid as much as possible. You should get some froth and bubbles. For a bigger dyebath, I use an old electric whisk. Observe carefully! First you will see the froth turning yellow, then slowly starting to shift towards a turquoise/green. When the green appears, the blue pigment will soon form on the surface of the green bubbles. As the liquid oxygenates, the indikan forms. The froth will soon turn yellow again, leaving the blue pigment lying on the surface in little clusters.

Sometimes the pigment is not apparent, yet there can still be a good amount in the liquid.

The liquid can be stored in sealed containers for use later or for filtering out the woad pigment. The latter is a separate process, not described in this article.

TO MAKE A FERMENTING VAT. Pour the liquid into a suitable vessel with an airtight fitting lid. Ceramic, plastic bucket or glass jar are all fine.

Fill to the brim as far as possible, so the oxygen left in the container is minimal.

To prepare the dyebath, an alkali/base is required, such as birch ash, washing soda or a little slaked lime. This raises the pH value.

Fermentation is activated with something sweet that contains anti-oxidants as well. This is open for experimentation. I recommend a little honey, a date, some madder or something similar from food waste. I also add a little wheat bran.

Keep the dyebath warm: a few degrees above body temperature.

During the summer, the vat can be left in a greenhouse. In winter, I usually wrap the vat in a thick woollen blanket and leave it near a radiator or other heat source.

Once the vat is active, all that remains is to invoke the 'Woad Goddess'.

IT CAN TAKE UP TO A WEEK before the vat has been fully reduced, sometimes even longer. Stir the vat carefully, at least once a day, but avoiding air getting into the dyebath.

Multi-sensory perception is involved in watching the fermentation process, with all its subtle changes of colour and scents.

The smell gets stronger with fermentation, dank and sweet, and can be likened to that arising from the natural, active decomposing in a forest – a bog. In the past people tasted their vats, which is not something I recommend.

If this smell develops and turns sharper and more pervasive, the dyebath may be overfermented, in which case add a little more base.

If the fermentation does not get going, the liquid feels thin and there is a faint smell of base, add a little more sweetener to get the right micro-organisms activated. After a while, bubbles might appear, depending on the process.

When the vat has become thicker, yellowish and olive-green and a fine, rust red sheen begins to form on the surface, it is time to start dyeing.

Do a little test piece, by putting in a sample and leaving it for a while.

When removed, the sample yarn or cloth should be a greeny yellow colour and slowly oxidizes to a blue colour.

DYEING. Place the fibre/textile for dyeing in water which is the same temperature as in the vat. Squeeze out all the water before lowering into the vat. I often use unwashed wool, as it contains things like urea and micro-organisms that feed the vat.

When the fibre/textile is removed from the dyebath and exposed to the oxygen in the air, it slowly turns blue, in an insoluble form. How long the material stays in the dyebath depends on the vat and the material. It could be anything from a short dip to an hour or two. Allow the dyed material to dry before leaving it in rinse water for some time.

The colour becomes more lightfast and colourfast with repeated dips, letting the material dry off between dips. This can build up a deep blue.

When the vat is exhausted, leave it resting. I keep mine going for years: they are like organisms in themselves, acquiring their own characters in the course of time.

It is unbelievably exciting, challenging and educational to work with these historic, artisanal methods, which require time, and simultaneously to assimilate these processes into my urban home and life – as one complete organism.

p 24 centre / Woad leaves torn and placed into warm water.
below / The blue pigment beginning to show on the surface with plenty of whisking.
right / Woad balls made from torn leaves.
top / Woad dyed organic linen knit garments. Collaborative art project with Lene Madsen, *Slow Fashion and Slow Colour,* shown at the opening of the Textile Fashion Center in Borås, spring 2014.
centre / Material dyed with woad by Jeanette Schäring.
right / Woad print on silk. Photo Jeanette Schäring.

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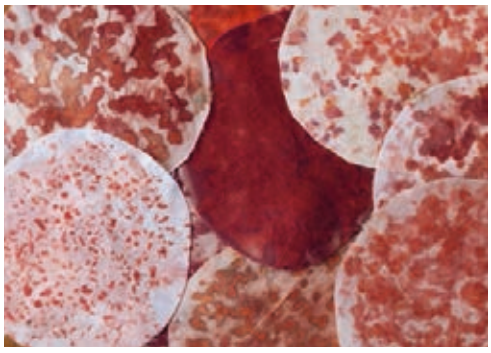

Madder

MADDER, *Rubia tinctoria,* is one of my favourites, with which I have experimented for many years. The plant can be cultivated in a pot on the balcony. It will not produce much red in the first year. Be patient and harvest the root after 3-4 years. I chop the root up fine and leave it in a little water in a lidded glass container, allowing it to ferment for a few days. There are an infinite number of possibilities for experimentation at this stage, for example with different types of water. Put fibre/textile material in the jar and leave on the window sill as decoration. It will be a source of wonder and admiration. Remove the fibre. Leave the dyebath standing for months – years – forget about it. I have left my dyebath standing outside through the winter, freezing over. The thawed dyebath produced some fantastic new reds in the spring.

Madder can be used for cold water dyeing, giving lots of lovely shades of red. For shades from rust to brick red, heat up the dyebath, or leave it in a warm place in the sun or a greenhouse. If heating up on a stove, in a pot, do not allow the temperature to go over 60 degrees. Try adding lime for strong reds and put a nail into the bath to get lilacs. Different fibres will produce a whole range of tonal variation in the same dyebath.

Do not throw the roots, re-use them!

above left and centre above / Madder.
Madder dyeing, using decomposing processes, on silk fabric.

Weld

WELD, *Reseda luteola*, produces one of the most colourfast yellows we get from nature, and it is very lightfast! It is easy to grow. The seed needs a little time to germinate. Fresh plant matter, leaves, flower and seed produce the clearest, loveliest, almost neon yellow shades. The plant can also be dried successfully.

DYEING WITH FRESH WELD. Tear up or chop and place in a pot of water. Heat up slowly and leave to simmer for an hour, then leave to cool. Strain off the plant material before dyeing, but don't throw it away as it can be used again.

Mordanting: I am very sparing with my use of alum, but I do use a bit for dyeing with weld.

The mordant fibre/material can be left in the dyebath for a day or more. Take the material out at intervals and check it. If a clear yellow is not appearing, experiment with altering chalk to change the hardness of the water. Keep testing!

When dyeing linen, I like mordanting with pomegranate peel, for example, that applies to dyeing with madder as well. Overdyeing weld with woad produces really beautiful shades of green. Madder overdyed with woad produces a fascinating range of shades from red-violet to various browns.

above / right and center below / Weld.
Dyeing with weld and overdyeing with woad.

MADDER (RUBIA TINCTORIA)

is a perennial (a herbaceous plant that lives for years, dying back in winter and growing again in spring). It is related to bedstraw and belongs to the *Rubiaceae* family, which is the same as the coffee family. Madder produces loads of beautiful reds: the soil, age of the roots, water constituents of the dyebath and temperature are just a few of the factors that determine the outcome.

WELD/LA VAU (RESEDA LUTEOLA)

Weld or La Vau, the older European name for this plant, is a biennial (two year) plant. It does not grow wild much in Sweden, except for down by the eastern coast near Ronneby. Seed for madder, weld, woad and Japanese indigo can be purchased from Jeanette Schäring:
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Indigo

NATURAL INDIGO is the natural pigment, extracted from indigo bearing plants, *Indigofera*, comprising some 700 species. *Indigofera tinctoria* is one of the most common indigo plants. It grows in tropical climates and is hard to grow on a large scale in Sweden. To use indigo, the pigment has to be converted by means of a fermentation process produced with natural ingredients. The traditional process was historically part of an eco-system, where the water used could be returned to the natural cycle as fertilizer and sustenance for micro-organisms.

Natural indigo pigment can be purchased from *Living blue* in Bangladesh, www.livingbluebd.com.

Synthetic indigo is produced through a chemical process in laboratories. Some of the chemicals used in the production of synthetic indigo pigment includes aniline, formaldehyde and prussic acid. These are highly toxic for human beings, animals and the natural environment. Synthetic indigo is one of the most used dyestuffs in the textile industry.

On my balcony terrace, I have been growing Japanese indigo, *Persicaria tinctoria*, for several years. It is an annual plant, sensitive to frost, that thrives in fertile soil and a warm, humid climate. It can grow almost anywhere.

Allow the seedlings to grow for 6-7 weeks before potting on. They can then go out once there is no risk of frost. The disadvantage with Japanese indigo is that the plant wants a lot of water. In Japan, the leaves are first fermented in a compostlike atmosphere to bring out the indigo, a very time-consuming process. This is then used for making the fabulous shades of dark blue.

IT IS POSSIBLE TO DYE with water and a little vinegar only and obtain turquoise blues. Unfortunately, this is not the most sustainable method, considering the amount of plant material and water used for the small amount of dye pigment that can be extracted. Nevertheless it is an experience that is very inspiring and makes you want to go further.

DYEING: Collect the plant material! Remove the foliage from the stems, tear and chop into a mass. Put this into a vessel with cold water and a little vinegar, stir and leave for a while. The vinegar helps the pigment dissolve. Press and knead the mass with your hands, use gloves if you don't want blue hands. Strain the mass and save the liquid, which should now be green, like chlorophyll. Put the kneaded mass of foliage into another vessel and repeat the procedure with fresh cold water and a dash of vinegar. The liquid should be dark green. Place the fibre into the dyebath and leave standing a good while. The fibre will initially take on a green tone, which will slowly alter to light blue and turquoise. The shade continues to change when the fibre is exposed to air. Dry and rinse. Repeat and keep testing to produce unique shades (reference, Dorothea Fischer). Strain, experiment with various fine textiles and different types of strainer. Beautiful patterns will arise between strainer, textile and leaf mass. I save my leaf mass, sort and dry it and then use it for more experiments. ∧

Tip: Warmth from an iron can bring out a different tone in your plant-dyed material, regardless of which plant was used. Experiment and enjoy!
above / *The Beauty of a Dead Language*. Indigo dyed, biological vat, re-cycled silk, beeswax, fine wire and fine dyed silk thread. Photo Jeanette Schäring.

RECOMMENDED READING

Natural Dyes, Sources, Tradition, Technology and Science, Dominique Cardon, 2007.
Koekboya Natural Dyes and Textiles, Harald Böhmer, 2002.
Jenny Dean's Wild Colour, 1994
Color: A Natural History of the Palette, Victoria Finlay, 2003.
The History of Woad and the Medieval Woad Vat, John Edmonds, ISBN: 0953413306